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## Title of the Invention

NITRIDE SEMICONDUCTOR DEVICE

*This application is a 371 of PCT/JP98/03336 filed 7/27/1998.*

## Technical field of the Invention

5 This invention relates to a device provided with a nitride semiconductor ( $\text{In}_x\text{Al}_y\text{Ga}_{1-x-y}\text{N}$ ,  $0 \leq x$ ,  $0 \leq y$ ,  $x+y \leq 1$ ) including light emitting devices such as LED (light emitting diode) and LD (laser diode), solar cells, light receiving devices such as optical sensors and electronic devices such as transistors and power  
10 devices.

## Background of the Invention

Nitride semiconductors have been recently produced as materials used for a high bright pure green LED and a blue LED  
15 in various light sources for a full color LED display, a traffic signal and an image scanner and the like. These LEDs basically have such a structure that a buffer layer, a n-side contact layer made of Si-doped GaN, an active layer of SQW (Single Quantum Well) made of InGaN or MQW (Multi Quantum Well) including InGaN, a p-side  
20 cladding layer made of Mg-doped AlGaN and a p-side contact layer made of Mg-doped GaN are laminated sequentially on the sapphire substrate. Such LEDs show excellent properties and for example, at 20mA, for blue LED having a light emitting wavelength of 450nm, 5mW of output and 9.1% of an external quantum efficiency can be  
25 achieved and for green LED having a light emitting wavelength of 520nm, 3mW of output and 6.3% of an external quantum efficiency

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